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10/700,310	10/31/2003	Ian Robinson	NG(ST)-6564	5457

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TAROLLI, SUNDHEIM, COVELL & TUMMINO L.L.P.
1300 EAST NINTH STREET, SUITE 1700
CLEVEVLAND, OH 44114

EXAMINER	
LEE, SIU M	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/700,310	Applicant(s) ROBINSON, IAN	
	Examiner Siu M. Lee	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *6/6/2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18,20-30,32,33,38-46 and 48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *34 and 37* is/are allowed.

6)☒ Claim(s) *1-18,20-30,32,33,38-42,44 and 48* is/are rejected.

7)☒ Claim(s) *45 and 46* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Response to Remarks

1. Applicant's arguments with respect to claims 1-17, 26-30, 34-35, 38-42, 44-46 has been considered but is moot in view of the new grounds of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rybicki et al. (US 7,184,490 B1) in view of Tomich et al. (US 7,099,316 B1).

Rybicki et al. discloses a transmitter comprising a digital exciter (signal generator 12 in figure 17) that provides a digital multi-carrier signal from baseband data (figure 9 is a schematic block diagram of the signal generator 12, column 4, lines 51-64); a digital-to-analog converter that converts the digital multi-carrier signal into an analog multi-carrier signal (DAC 132 in figure 17, column 7, lines 1-2); and a plurality of antennas, each of the plurality of antennas transmitting at least one of the plurality of analog carrier signals (transmitting module 24 in figure 17, figure 8 shows the details of the transmitting module 24 which includes a plurality of antenna 44-48, column 4, lines 44-50).

Rybicki et al. fails to explicitly disclose a signal distributor that deserializes the analog multi-carrier signal into a plurality of analog carrier signals.

However, Tomich et al. discloses a signal distributor that deserializes the analog multi-carrier signal into a plurality of analog carrier signals (distributor 402 in figure 10 contains a deserializer that change the serial output into a parallel data stream (column 13, lines 37-42).

It is desirable to have a signal distribution that deserializes the analog multi-carrier signal into a plurality of analog carrier signal because it improves the flexibility and scalability of the system (column 15, lines 6-7). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Tomich et al. in the system of Rybicki et al. to improve the flexibility of the system.

4. Claims 2, 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rybicki et al. (US 7,184,490 B1) in view of Tomich et al. (US 7,099,316 B1) as applied to claim 1 above, and further in view of Toivola (US 6,081,515).

(1) Regarding claim 2:

Rybicki et al. and Tomich et al. discloses all the subject matter as discuss in claim 1 above except the signal distributor comprising at least one filter, the at least one filter being electrically adjustable by the exciter as to change at least one frequency characteristic associated with the at least one filter.

However, Toivola discloses the signal distributor (antenna arrangement in figure 4a) comprising at least one filter (electrical controllable filter 41_1 to 41_n, column 8, lines

15-31), the at least one filter being electrically adjustable (a number of controllable filter arrangements provided in the antenna arrangement are tuned (step 180 in figure 9) which suitable is done by the base station, how and where they are tuned can naturally be done in a suitable way, column 10, lines 21-24, as shown in figure 3 that the base station 10 comprises the combiner (frequency combiner 1), it would be obvious that the controllable filter is being electrically control by the exciter) by the exciter as to change at least one frequency characteristic associated with the at least one filter.

It is desirable for the signal distributor comprising at least one filter, the at least one filter being electrically adjustable by the exciter as to change at least one frequency characteristic associated with the at least one filter because only some of the single-frequency signals are needed to be amplified, simple amplification devices can be used (column 5, lines 17-19). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Toivola in the system of Rybicki et al. and Tomich et al. to simplify the system.

(2) Regarding claim 4:

Toivola further discloses that the at least one frequency characteristic comprising a center frequency of a passband associated with the at least one filter (it become possible to use controllable bandpass filter, column 10, lines 35-36).

(3) Regarding claim 5:

Toivola further discloses that the at least one frequency characteristic comprising respective center frequencies of a plurality of passbands (an amplifier can frequently be arranged for two electrically controllable filters, an amplification device for three

electrically controllable filters or every conceivable combination, column 8, lines 20-31), the center frequency of each passband being electrically adjustable by the exciter (a number of controllable filter arrangements provided in the antenna arrangement are tuned (step 180 in figure 9) which suitable is done by the base station, how and where they are tuned can naturally be done I a suitable way, column 10, lines 21-24, as shown in figure 3 that the base station 10 comprises the combiner (frequency combiner 1), it would be obvious that the controllable filter is being electrically control by the exciter).

(4) Regarding claim 6:

Rybicki et al and Tomich et al. discloses all the subject matter as discuss in claim 1 except the at least one frequency characteristic being a center frequency of a stopband associated with the at least one filter.

However, Toivola discloses the at least one frequency characteristic being a center frequency of a stopband associated with the at least one filter (the electrically controllable filter 4_1 to 4_n are so tuned that from everyone a signal having desirable frequency is received, in such electrically controllable filter all remaining frequencies are filter away except the just the one which is preferred for each filter, column 6, lines 57-61).

It is desirable for the at least one frequency characteristic being a center frequency of a stopband associated with the at least one filter because it is easy to repair or change (column 5, lines 26-27). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Toivola in the system of Rybicki et al. and Tomich et al. to increase the flexibility of the system.

(5) Regarding claim 7:

Toivola further discloses that the at least one frequency characteristic comprising respective center frequencies of a plurality of stopbands (an amplifier can frequently be arranged for two electrically controllable filters, an amplification device for three electrically controllable filters or every conceivable combination, column 8, lines 20-31), the center frequency of each stopband being electrically adjustable by the exciter (a number of controllable filter arrangements provided in the antenna arrangement are tuned (step 180 in figure 9) which suitable is done by the base station, how and where they are tuned can naturally be done I a suitable way, column 10, lines 21-24, as shown in figure 3 that the base station 10 comprises the combiner (frequency combiner 1), it would be obvious that the controllable filter is being electrically control by the exciter).

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rybicki et al. (US 7,184,490 B1) and Tomich et al. (US 7,099,316 B1) in view of Toivola (US 6,081,515) as applied to claim 2 above, and further in view of Lau et al. (US 6,291,924 B1).

Rybicki et al., Tomich et al. and Toivola disclose all the subject matter as discuss in claim 2 except the at least one filter comprising a surface acoustic wave (SAW) filter having at least one electrically actuatable micromechanical structures.

However, Lau et al. discloses a surface acoustic wave (SAW) filter having at least one electrically actuatable micromechanical structures (column 9, line 59-column 10, line24).

It is desirable to surface acoustic wave (SAW) filter having at least one electrically actuatable micromechanical structures because it avoids the need to fabricate a new SAW device (column 1, lines 62-63). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Lau et al. in the system of Rybicki et al., Tomich et al., and Toivola to improve the flexibility of the system.

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rybicki et al. (US 7,184,490 B1) and Tomich et al. (US 7,099,316 B1) in view of Toivola (US 6,081,515) as applied to claim 2 above, and further in view of Jago et al. (US 2003/0171674 A1).

Rybicki et al., Tomich et al., and Toivola disclose all the subject matter as discuss in claim 2 Tomich et al. further discloses that the signal distributor comprising a demultiplexer 408 except the multiplexer is a time division demultiplexer.

However, Jago et al. discloses a signal distributor (signal separator 56) comprising a time division demultiplexer (the signal separator 56 in figure 3 is implemented using a time-division demultiplexer 64, paragraph 0022, lines 4-5).

It is desirable for the signal distributor comprising a time division demultiplexer because it simplified the system and reduce the hardware required (paragraph 0009, lines 1-6). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Jago et al. in the system of Rybicki et al., Tomich et al., and Toivola to simplify the system.

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rybicki et al. (US 7,184,490 B1) and Tomich et al. (US 7,099,316 B1) as applied to claim 1 above, and further in view of Pratt (US 6,664,921 B2).

Rybicki et al. and Tomich et al. disclose all the subject matter as discuss in claim 1 except the signal distributor comprising a plurality of decoders, providing respective despreading codes to a multi-carrier signal.

However, Pratt discloses the signal distributor (plurality of channel 167) comprising a plurality of decoders, providing respective despreading codes to a multi-carrier signal (the plurality of channels 167 each containing a mixer 167A which receives the same respective code as that applied in respect of the relevant antenna in mixer 150C, this has the effect of isolating the representation of the respective received signal at the output of the mixer 167A, this output representation then being split into plural sub-channel 169, column 10, lines 3-10).

It is desirable for the signal distributor comprising a plurality of decoders, providing respective despreading codes to a multi-carrier signal because it improves the phase tracking accuracy (column 2, lines 60-64). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Pratt in the system of Rybicki et al. and Tomich et al. to improve the performance of the system.

8. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over et al. (US 7,184,490 B1) and Tomich et al. (US 7,099,316 B1) as applied to claim 1 above, and further in view of Naidu et al. (US 5,805,983).

(1) Regarding claim 10:

Rybicki et al. and Tomich et al. disclose all the subject matter as discuss in claim 1 except the exciter and the digital-to-analog converter being located at a first location, and at least one of the pluralities of antennas being located at a second location, spatially remote from the first location.

However, Naidu et al. discloses the exciter and the digital-to-analog converter being located at a first location, and at least one of the plurality of antennas being located at a second location, spatially remote from the first location (base station 50_1 and 50_2 are connected to the remote antenna 68_1, 68_2, 70_1 and 70_2 through fiber node 58 and coaxial cable 60, column 1, line 58-column 2, line1).

It is desirable for the exciter and the digital-to-analog converter being located at a first location, and at least one of the plurality of antennas being located at a second location, spatially remote from the first location because it enhanced the air frame timing between cells served by the remote antenna unit (column 1, lines 24-26). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Naidu et al. in the system of Rybicki et al. and Tomich et al. to improve the performance of the system.

(2) Regarding claim 11:

Rybicki et al. and Tomich et al. disclose all the subject matter as discuss in claim 1 except at least one antenna being located at a third location, spatially remote from the first location and the second location.

However, Naidu et al. disclose at least one antenna being located at a third location, spatially remote from the first location and the second location (as shown in figure 3, each of the four transmission paths may have different length which cause different delay time for the signal, column 2, lines 50-52).

It is desirable for at least one antenna being located at a third location, spatially remote from the first location and the second location because it equalizes the system without requiring the transmission link to be out of service during the upgrades or repairs (column 9, lines 26-30). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Naidu et al. in the system of Rybicki et al. and Tomich et al. to improve the reliability of the system.

9. Claims 12, 13, 15, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt (US 6,664,921 B2) in view of Hotto (US 2003/0027541 A1).

(1) Regarding claim 12:

Pratt discloses a receiver assembly comprising at least one antenna (antenna ANT 1 to ANT K in figure 4), a plurality of analog carrier signals being received at the at least one antenna (radio frequency signal is received by each antenna element 10A, column 9, lines 28-30); a signal combiner (front end antenna circuits 150, adder 155, bandpass filter 161 and the amplifier 163) that combines the analog carrier signals at

least one antenna into an analog multi-carrier signal (column 9, lines 57-62); an analog-to-digital converter (ADC 165 in figure 4) that converts the analog multi-carrier signal into a digital multi-carrier signal (column 9, lines 62-63); and a digital processing assembly that processes the digital multi-carrier signal to extract information from the multi-carrier signal (column 10, lines 2-15).

Pratt fails to disclose at least one passband filter, each of the at least one passband filter being associated with a respective one of the at least one antenna, having a plurality of passband, a respective center frequency of each passband being electrically adjustable by the digital processing assembly.

However, Hotto discloses a receiver that contains at least one passband filter, each of the at least one passband filter being associated with a respective one of the at least one antenna, having a plurality of passband, a respective center frequency of each passband being electrically adjustable by the digital processing assembly (the PFC includes a frequency bandpass filter for attenuating signals having a frequency not equal to a pass frequency, and the controller dynamically establishes the pass frequency, paragraph 0011, lines 1-10).

It is desirable to have a passband filter, each of the at least one passband filter being associated with a respective one of the at least one antenna, having a plurality of passband, a respective center frequency of each passband being electrically adjustable by the digital processing assembly because it provides a cost effective method for reconstruction the signal (paragraph 0007, lines 9-12). Therefore, it would have been

obvious to one of ordinary skill in the art at the time of invention to combine the teaching of Hotto and the system of Pratt to improve the cost effectiveness of the system.

(2) Regarding claim 13:

Pratt discloses the signal combiner comprising at least one mixer (mixers 150C) for downconverting analog carrier signals, a given mixer being associated with a respective one of the at least one antennas and having an associated intermediate frequency (the mixers 150C serve as down converters, converting the received signals to an intermediate frequency, column 9, lines 57-59).

(3) Regarding claim 15:

Pratt discloses the signal combiner comprising a code division multiple access multiplexer (the separate antenna circuits are code-division-multiplexed prior to most of the radio frequency and intermediate frequency processing, the signal from each channel is multiplied by a pn code from code generator 153, column 9, lines 25-38, 43-51).

(4) Regarding claim 16:

Pratt discloses the signal combiner comprising a plurality of coders that provide respective spreading codes to the analog carrier signals, the respective spreading codes being mutually orthogonal (the pseudo random bit sequence code generator 153 generates a different code signal for each antenna signal, column 9, lines 43-51).

10. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt (US 6,664,921 B2) in view of Hotto (US 2003/0027541 A1) as applied to claim 12 above, and further in view of Ishikawa et al. (US 5,408,690).

Pratt and Hotto disclose all the subject matter as discuss in claim 12 except the signal combiner comprising a frequency multiplexer.

However, Ishikawa et al. discloses a signal combiner (combiner 204 in figure 16) comprising a frequency multiplexer (column 26, lines 37-40).

It is desirable for a signal combiner comprising a frequency multiplexer because a precision of detecting the level of the reflected wave can be remarkably improved (column 14, line68-column 15, line2). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Ishikawa et al. in the system of Pratt and Hotto to improve the performance of the system.

11. Claim 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt (US 6,664,921 B2) in view of Hotto (US 2003/0027541 A1) as applied to claim 12 above, and further in view of Currivan et al. (US 7,110,434 B2).

(1) Regarding claim 17:

Pratt and Hotto disclose all the subject matter as discuss in claim 12 except the at least one antenna having respective associated tracking assemblies that determine a frequency band associated with an interfering signal.

However, Currivan et al. discloses a tracking loop that track a frequency band associated with an interfering signal (tracking loop that automatically adjust the

frequency of the notch as the interference changes, Say there is narrowband interference, and we have applied a notch that cancels it, when the interference changes the frequency, a tracking loop that automatically sews the frequency location of the notch to track the frequency of the interference, column 30, lies 45-52).

It is desirable to have a respective associated tracking assembly that determine a frequency band associated with an interfering signal because it can monitor the interference and have the cancellation circuit to remove the interference from the incoming signal. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the tracking loop of Currivan et al. with the receiver of Pratt and Hotto to improve the performance of the receiver.

(2) Regarding claim 18:

Currivan et al. further discloses that the at least one antenna having respective associated stopband filters that attenuate the interfering signal in response to the determination of the associated tracking assembly (the tracking loop will track the frequency of the interference and then change the frequency location of the notch to cancel the interference, column 30, lines 45-52).

12. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt (US 6,664,921 B2) in view of Hotto (US 2003/0027541 A1) as applied to claim 12 above, and further in view of Nago (US 5,974,101).

Pratt and Hotto disclose all the subject matter as discuss in claim 12 except the at least one antenna having respective cancellation assemblies that generates an

inverted phase representation of at least one interference signal received at their respective antennas.

However, Nago discloses a cancellation assembly that generates an inverted phase representation of at least one interference signal received at their respective antenna (phase shifter 310 in figure 17 generates a inverted phase signal to cancel the interference signal in the received signal, column 29, lines 36-43).

It is desirable to have respective cancellation assembly that generates an inverted phase representation of at least one interference signal received at their respective antennas because it can remove the interference signal from the received signal and prevent degradation of the quality of the communication (column 8, lines 21-26). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the teaching of Nago with the receiver of Pratt and Hotto to improve the performance of the receiver.

13. Claims 21 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt (US 6,664,921 B2) in view of Hotto (US 2003/0027541 A1) as applied to claim 12 above, and further in view of Naguib et al. (US 2004/0228283 A1).

(1) Regarding claim 21:

Pratt and Hotto disclose all the subject matter as discussed in claim 12 except the at least one antenna being one antenna and the signal combiner comprising a bypass, such that a carrier signal from the antenna can bypass the signal combiner.

However Naguib et al. discloses a receiver with one antenna (antenna 402) without the combiner so that the a carrier signal from the antenna can bypass the combiner (the receiver in figure 4B, the signal received by the antenna 402 is pass to the ADC 494 without passing through a combiner, paragraph 0068 to paragraph 0072) (as described in the disclosure of the instant application, when there is only one antenna, the combiner can be omitted, paragraph 0069 and 0074).

It is desirable when the at least one antenna being one antenna and the signal combiner comprising a bypass, such that a carrier signal from the antenna can bypass the signal combiner because it simplifies the receiver and reduce production cost. Therefore, it w would have been obvious to one of ordinary skill in the art at the time of invention to combine the teaching of Naguib et al. with the receiver of Pratt and Hotto to reduce the production cost of the receiver.

(2) Regarding claim 24:

Naguib et al. further discloses the at least one antenna having respective passband filters (filter 480 in figure 4B is a filter bank having a number of tunable filters that can be tuned to any sub-carrier band in the communication system, paragraph 0069, lines 5-8), the filters having a plurality of passbands, a respective center frequency of each passband being electrically adjustable by the digital processing assembly (the tunable filters are tuned to the sub-carrier frequency bands that are not allocated to the communication link to the receiver 400, paragraph 0068, lines 8-12).

It is desirable for the antenna to have respective passband filters, the filters having a plurality of passband, a respective center frequency of each passband being

electrically adjustable by the digital processing assembly because the subcarrier allocated to a particular communication link do not need to be adjacent and may be any of the available sub-carriers in the OFDM system (paragraph 0075, lines 5-8). Therefore, it w would have been obvious to one of ordinary skill in the art at the time of invention to combine the teaching of Naguib et al. with the receiver of Pratt and Hotto to increase the flexibility of the receiver.

14. Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt (US 6,664,921 B2) in view of Hotto (US 2003/0027541 A1) and Naguib et al. (US 2004/0228283 A1) as applied to claim 21 above, and further in view of Currivan et al. (US 7,110,434 B2).

(1) Regarding claim 22:

Pratt, Hotto and Naguib et al. disclose all the subject matter as discuss in claim 12 except the at least one antenna having respective associated tracking assemblies that determine a frequency band associated with an interfering signal.

However, Currivan et al. discloses a tracking loop that track a frequency band associated with an interfering signal (tracking loop that automatically adjust the frequency of the notch as the interference changes, Say there is narrowband interference, and we have applied a notch that cancels it, when the interference changes the frequency, a tracking loop that automatically sews the frequency location of the notch to track the frequency of the interference, column 30, lies 45-52).

It is desirable to have a respective associated tracking assembly that determine a frequency band associated with an interfering signal because it can monitor the interference and have the cancellation circuit to remove the interference from the incoming signal. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the tracking loop of Currivan et al. with the receiver of Pratt, Hotto and Naguib et al. to improve the performance of the receiver.

(2) Regarding claim 23:

Currivan et al. further discloses that the at least one antenna having respective associated stopband filters that attenuate the interfering signal in response to the determination of the associated tracking assembly (the tracking loop will track the frequency of the interference and then change the frequency location of the notch of the notch filter to cancel the interference, column 30, lines 45-52).

15. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt (US 6,664,921 B2) in view of Hotto (US 2003/0027541 A1) and Naguib et al. (US 2004/0228283 A1) as applied to claim 21 above, and further in view of Nago (US 5,974,101).

Pratt, Hotto and Naguib et al. disclose all the subject matter as discussed in claim 21 except the at least one antenna having respective cancellation assemblies that generate an inverted phase representation of at least one interfering signal received at their respective antenna.

However, Nago discloses a cancellation assembly that generates an inverted phase representation of at least one interference signal received at their respective antenna (phase shifter 310 in figure 17 generates a inverted phase signal to cancel the interference signal in the received signal, column 29, lines 36-43).

It is desirable to have respective cancellation assembly that generates an inverted phase representation of at least one interference signal received at their respective antennas because it can remove the interference signal from the received signal and prevent degradation of the quality of the communication (column 8, lines 21-26). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the teaching of Nago with the receiver of Pratt, Hotto and Naguib et al. to improve the performance of the receiver.

16. Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt (US 6,664,921 B2) in view of Hotto (US 2003/0027541 A1) as applied to claim 12 above, and further in view of Naidu et al. (US 6,128,470).

(1) Regarding claim 26:

Pratt and Hotto discloses all the subject matter as discuss in claim 12 except the analog-to-digital converter and the digital processing assembly being located at a first location, and a first of the at least one antenna being located at a second location, spatially remote from the first location.

However, Naidu et al. discloses the analog-to-digital converter and the digital processing assembly being located at a first location, and a first of the at least one

antenna being located at a second location, spatially remote from the first location (the system comprises a plurality of remote antenna unit 68_1, 68_2, 70_1, 70_2 connect to the base station equipment 50_1 and 50_2 in figure 2, column 1, lines 43-54).

It is desirable for the analog-to-digital converter and the digital processing assembly being located at a first location, and a first of the at least one antenna being located at a second location, spatially remote from the first location because it reduces the cumulative noise in a distributed antenna network (column 2, lines 48-50). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Naidu et al. in the system of Pratt and Hotto to improve the quality of the system.

(2) Regarding claim 27:

Naidu et al further discloses that a second of the at least one antenna being located at a third location, spatially remote from the first location and the second location (the system comprises a plurality of remote antenna unit 68_1, 68_2, 70_1, 70_2 connect to the base station equipment 50_1 and 50_2 in figure 2, column 1, lines 43-54).

17. Claims 28, 30, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clifford (US 7,013,166 B2) in view of Currivan et al. (US 7,110,434 B2).

(1) Regarding claim 28:

Clifford discloses a system comprising means for combining a plurality of carrier signals into a combined multi-carrier signal represented in a first domain (combiner unit

361 in figure 4 combines the channel signals received from each channel of each sector antenna in analog domain, column 3, lines 63-65); means for converting the combined multi-carrier signal from the first domain to a second domain (analog-to-digital converter circuit 365 converted the analog baseband multicarrier signal into digital domain, column 4, lines 10-13); and means for distributing the converted multi-carrier signal into a plurality of signals represented in the second domain (baseband channelizer unit 366 adapted to re-allocate individual data of the data stream to the respective original channel, column 4, lines 13-18).

Clifford fails to disclose means for determining a frequency band associated with an interfering signal.

However, Currivan et al. discloses a tracking loop that track a frequency band associated with an interfering signal (tracking loop that automatically adjust the frequency of the notch as the interference changes, Say there is narrowband interference, and we have applied a notch that cancels it, when the interference changes the frequency, a tracking loop that automatically sews the frequency location of the notch to track the frequency of the interference, column 30, lines 45-52).

It is desirable to have a respective associated tracking assembly that determine a frequency band associated with an interfering signal because it can monitor the interference and have the cancellation circuit to remove the interference from the incoming signal. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the tracking loop of Currivan et al. with the system of Clifford to improve the performance of the receiver.

(2) Regarding claim 30:

Clifford discloses the means for converting the multi-carrier signal from a first domain to a second domain comprising means for converting an analog multi-carrier signal into a digital multi-carrier signal (analog-to-digital converter circuit 365 converted the baseband multicarrier signal into digital domain, column 4, lines 10-13).

(3) Regarding claim 32:

Currivan et al. further discloses means for attenuating the interference signal in response to the determination of the associated tracking assembly (tracking loop that automatically adjust the frequency of the notch as the interference changes, Say there is narrowband interference, and we have applied a notch that cancels it, when the interference changes the frequency, a tracking loop that automatically sews the frequency location of the notch to track the frequency of the interference, column 30, lies 45-52).

18. Claim 29 rejected under 35 U.S.C. 103(a) as being unpatentable over Rybicki et al. (US 7,184,409B1) in view of Currivan et al. (US 7,110,434 B2).

Rybicki et al. discloses a system that comprises:

means for combining a plurality of carrier signals into a combined multi-carrier signal represented in the first domain (adder 86 in figure 11 sums the mixed signal partitions to produce a resulting signal, column 5, lines 63-64);

means for converting the combined multi-carrier signal from the first domain to a second domain (DAC 88 in figure 11 convert the combined multi-carrier signal from the digital domain to the analog domain, column 5, lines 64-65);

means for distributing the converted multi-carrier signal into a plurality of signals represented in the second domain (the RF up-conversion section 90 and the down-conversion mixing module 92 distribute the converted multi-carrier signal into a plurality of processed signal partitions 34, column 5, line 66- column 6, line 6).

the means for converting the multi-carrier signal from a first domain to a second domain comprising means for converting a digital multi-carrier signal into an analog multi-carrier signal (DAC 88 in figure 11 convert the digital multi-carrier signal to the analog multi-carrier signal, column 5, lines 64-65).

Rybicki et al. fails to disclose means for determining a frequency band associated with an interference signal.

However, Currivan et al. discloses a tracking loop that track a frequency band associated with an interfering signal (tracking loop that automatically adjust the frequency of the notch as the interference changes, Say there is narrowband interference, and we have applied a notch that cancels it, when the interference changes the frequency, a tracking loop that automatically sews the frequency location of the notch to track the frequency of the interference, column 30, lies 45-52).

It is desirable to have a respective associated tracking assembly that determine a frequency band associated with an interfering signal because it can monitor the interference and have the cancellation circuit to remove the interference from the

incoming signal. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the tracking loop of Currivan et al. with the system of Rybicki et al. improve the performance of the receiver.

19. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clifford (US 7,013,166 B2) in view of Currivan et al. (US 7,110,434 B2) as applied to claim 28 above, and further in view of Nago (US 5,974,101).

Clifford and Currivan et al. disclose all the subject matter as discussed in claim 28 except further comprising means for generating an inverted phase representation of at least one interfering signal associated with the plurality of carrier signals.

However, Nago discloses a cancellation assembly that generates an inverted phase representation of at least one interference signal received at their respective antenna (phase shifter 310 in figure 17 generates a inverted phase signal to cancel the interference signal in the received signal, column 29, lines 36-43).

It is desirable to have means for generating an inverted phase representation of at least one interfering signal associated with the plurality of carrier signals because it can remove the interference signal from the received signal and prevent degradation of the quality of the communication (column 8, lines 21-26). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Nago with the system of Clifford and Currivan et al. improve the performance of the receiver.

20. Claims 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clifford (US 7,013,166 B2) in view of Nago (US 5,974,101).

(1) Regarding claim 38:

Clifford discloses a method of processing a plurality of carrier signals comprising receiving a plurality of analog carrier signals at a plurality of antennas (multi-carrier 36 receives channel signals from each channel of each sector antenna, column 3, lines 63-66); combining the plurality of analog carrier signals into a multi-carrier analog signal (combiner 361 combines the channels signals received from each channel of each sector antenna, column 3, lines 63-66); converting the analog multi-carrier signal into a digital multi-carrier signal (analog-to-digital converter circuit 365 converts the baseband analog multi-carrier signal into digital data stream, column 4, lines 10-13); and processing the digital multi-carrier signal at a digital processing assembly (the baseband channelizer 366 adapted to re-allocated individual data of the data stream to the respective original channel, which are further processed in the base transceiver station 30, column 4, lines 13-18).

Clifford fails to disclose generating an inverted phase representation of at least one interfering signal associated with the plurality of carrier signal.

However, Nago discloses a cancellation assembly that generates an inverted phase representation of at least one interference signal received at their respective antenna (phase shifter 310 in figure 17 generates a inverted phase signal to cancel the interference signal in the received signal, column 29, lines 36-43).

It is desirable to generating an inverted phase representation of at least one interfering signal associated with the plurality of carrier signal because it can remove the interference signal from the received signal and prevent degradation of the quality of the communication (column 8, lines 21-26). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Nago with the system of Clifford to improve the performance of the receiver.

(4) Regarding claim 39:

Clifford discloses the combining of the plurality of analog carrier signals comprising converting each received carrier signal to a unique frequency (combiner 361 combine the channel signals received from each channel of each sector antenna by allocating an individual narrowband carrier to each channel signal and modulating the allocated carrier based on the channel signal, column 3, line 64-column 4, line1).

21. Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clifford (US 7,013,166 B2) in view of Nago (US 5,974,101) as applied to claim 38 above, and further in view of Pratt (US 6,664,921 B2).

Clifford and Nago discloses all the subject matter as discuss in claim 28 except the combining of the plurality of analog carrier signals comprising applying a spreading code to each of the analog carrier signals and summing.

However, Pratt discloses the combining of the plurality of analog carrier signals comprising applying a spreading code to each of the analog carrier signals and summing (the antenna circuit 150 and the adder 155 in figure 4, column 9. lines 40-51).

It is desirable to combine the plurality of analog carrier signals comprising applying a spreading code to each of the analog carrier signals and summing because it has the advantage of improving the signal-to-noise ratio of each of the signal being observed (column 5, lines 40-42). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Pratt in the system of Clifford and Nago to improve the quality of the signal.

22. Claims 41 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clifford (US 7,013,166 B2) in view of Nago (US 5,974,101) as applied to claim 38 above, and further in view of Pugel et al. (US 2004/0041945 A1).

(1) Regarding claim 41:

Clifford and Nago disclose all the subject matter as discuss in claim 38 except the method further comprising determining a frequency band associated with an interfering signal.

However, Pugel et al. discloses a method that determining a frequency band associated with an interfering signal (demodulator 174 demodulates he digitized signal from ADC 172 and provides the microprocessor 50 with the signal-to-noise information, microprocessor 50, via PLLIC 30 and DAC IC 40 controls the tunable circuit 114 to attenuates the undesirable signal which might cause cross-modulation interference, paragraph 0017, lines 1-3 and paragraph 0022, lines 1-8).

It is desirable to determining a frequency band associated with an interfering signal because it provides protection from interference and reduce loss (paragraph

0017, lines 5-8). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the teaching of Pugel et al. in the method of Clifford to improve the performance of the method.

(2) Regarding claim 42:

Clifford further discloses attenuating the interfering signal in response to the determination of the associated tracking assembly (microprocessor 50, via PLLIC 30 and DAC IC 40 controls the tunable circuit 114 to attenuates the undesirable signal which might cause cross-modulation interference, paragraph 0017, lines 1-3 and paragraph 0022, lines 1-8).

23. Claims 44 rejected under 35 U.S.C. 103(a) as being unpatentable over Affes et al. (US 2002/0051433 A1) in view of Pratt (US 6,664,921 B2).

Affes et al. discloses a receiver assembly comprising:

a plurality of antennas that each receive an analog signal comprising at least one frequency band of interest and at least one frequency band containing an interfering signal (a base station 11 in figure 1 quipped with a receiving antenna comprising an array of several antenna element 12^1 to 12^M, paragraph 0114, lines 3-5);

a digital processing component (constrains-set generator 42A and constrain matrix generator 43A in figure 9) that receives the digital representation of analog signal and produce a control signal from each digital representation, representing an associated antenna, specifying the at least one frequency band containing the interfering signal (the constraints-set generator 42A supplies the set of constraints C_n to

a constraint matrix generator 43A which uses them to form a constrain matrix $\hat{C}_n$ and an inverse matrix Q_n which supplies to the beamformer 47^d and each of the corresponding beamformers in the other receiver modules of set D, paragraph 0201, 19-25); and

a plurality of adjustable filter (each of the MRC beamformer 27 in figure 5 comprises a spatio-temporal maximum ratio combining filter which filters the space time vector to produce the despread signal component, paragraph 0124, 1-5), each adjustable filter being associated with one of the plurality of antennas (each spatio temporal receiver module 20^1 to 20^U have its input connected to the output of the respective one of the despreaders 19^1 to 19^U, paragraph 0119, lines 7-10), a given adjustable filter being electrically adjustable to change at least one frequency characteristic associated with the filter in response to the control signal associated with the associated antenna of the given adjustable filter as to attenuate the specific at least one frequency band within the analog signal received at the associated antenna of the given adjustable filter (the constraints-set generator 42 and constraint matrix generator 43 responsive to symbol estimates and to channel estimates comprising at least said channel vector estimates for channels of a first group (I) of said plurality of user stations to provide at least one constraint matrix representing interference subspace of components of the received signal corresponding to said predetermined group, and in each of one or more receiver modules of a second group of said plurality of receiver modules, the coefficient tuning means produces said set of weighting coefficients in dependence upon both the constraint matrix and the channel vector estimates so as to tune said one or more receiver modules each towards a substantially null response to

that portion of the received signal corresponding to said interference subspace, paragraph 0023, lines 5-15, claim 1, lines 50-68).

Affes et al. fails to disclose an analog-to-digital converter that creates a digital representation of each analog signal;

However, Pratt discloses an analog-to-digital filter that creates a digital representation of each analog signal (ADC 165 in figure 4, column 9, lines 60-65).

It is desirable to have an analog-to-digital converter that creates a digital representation of each analog signal because digital data can withstand interference better than analog signal. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the teaching of Pratt in the system of Affes et al. to improve the reliability of the system.

(2) Regarding claim 48:

Affes et al. further discloses a signal combiner that combines the analog signal from the plurality of antennas into a multi-carrier signal (adder 16 in figure 2, paragraph 0118, lines 1-4).

Affes et al. fails to disclose an analog-to-digital converter that converts the analog multi-carrier signal into a digital multi-carrier signal.

However, Pratt further discloses an analog-to-digital converter that converts the analog multi-carrier signal into a digital multi-carrier signal (ADC 165 in figure 4, column 9, lines 60-65).

Allowable Subject Matter

24. Claims 34 and 37 are allowed.

25. Claims 45, and 46 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

26. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yeap et al. (US 2001/0050987 A1) discloses a RFI canceller using narrowband and wideband noise estimator. Axness et al. (US 7,162,218 B2) discloses a system and method for a direct conversion multi-carrier processor. Lee et al. (US 6,587,081 B1) discloses a method and apparatus for eliminating intermodulation interference in cellular telephone system. Ibrahim et al. (US 6,914,437 B2) discloses a filter calibration and application thereof. Hamilton-Piercy et al. (US 5,809,395) discloses a remote antenna driver for a radio telephony system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Siu M. Lee whose telephone number is (571) 270-1083. The examiner can normally be reached on Mon-Fri, 7:30-4:00 with every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on (571) 272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Siu M Lee
Examiner
Art Unit 2611
8/15/2007

CHIEH M. FAN
SUPERVISORY PATENT EXAMINER